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16. Abstract (Limit: 200 words)

The purpose of the Workshop was (1) to consider the possibilities for collaboration among federal and state organizations that either build, or sponsor the building of, data resources in the areas of toxicology and the environment; and (2) to facilitate the use of existing data resources in these subject areas by state organizations. Many states, far from having the luxury of building data resources, face grave difficulties in gaining access to the toxicology information that is already available. If building a cooperative database is the long-term goal of this community, then solving the "access problem" is an immediate goal. Three categories of state needs for information and data resources were identified: (1) improved methods for rapid, informal inter-state and state-federal communications; (2) improved access to existing databases; (3) coordination/collaboration in database building. The Steering Committee made several recommendations related to establishing a "Coordinating Council for Toxicological and Environmental Data Resources" and for necessary financial and personnel resources. In addition to the sumary, papers and reports, the appendices include the workshop agenda and attendees, a questionaire for the California HESIS survey, chemicals ranked by number of responses in the HESIS survey, and a description of the GTE/Medical Information Network (MINET).

17. Document Analysis a. Descriptors

Information Resources
Environment
Toxicology
Data Resources
data access
toxicological databases
cooperative database

b. Identifiers/Open-Ended Terms

State/Federal
Development
Communications

c. COSATI Field/Group

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State/Federal Workshop on Joint Development of Environmental and Toxicological Information Resources

Report of the Steering Committee

Background. The need for coordinated, readily accessible information about toxicology and the environment is ever growing. Several state and federal organizations have been building, or are planning to build, computer-based databases describing the chemical, physical and biological properties of hazardous chemicals. In most of these projects, the chemicals and properties under consideration are similar. Since database building and maintenance are resource intensive efforts, coordination and collaboration among these organizations can lead both to savings for the builders and to improved services for the users of these databases. Informal discussions about sharing among the builders and potential builders of these databases led to the organization of a *State/Federal Workshop on the Joint Development of Environmental and Toxicological Information Resources.*

The Workshop, held on May 28-29, 1985, at the National Library of Medicine, was sponsored by the National Governors Association (NGA), the Environmental Protection Agency (EPA), the National Library of Medicine (NLM), the Centers for Disease Control (CDC), and the Association of State and Territorial Health Officials. Its purpose was (1) to consider the possibilities for collaboration among federal and state organizations that either build, or sponsor the building of, data resources in the areas of toxicology and the environment; and (2) to facilitate the use of existing data resources in these subject areas by state organizations.

Findings. There was near universal agreement among Workshop participants that greater cooperation in the future among state and federal agencies who are building, or planning to build, databases would greatly reduce costs and improve information retrieval.

The Workshop discussions also revealed that many states, far from having the luxury of building data resources, face grave difficulties simply in gaining access to the toxicology information that is already available in one database or another. If building a cooperative database is the long-term goal of this community, then solving the "access problem" is certainly an immediate goal.

There was also consensus on two other subjects: (1) that future cooperation on data resource building--in whatever form is finally agreed upon--will require a "committee structure" of some sort that can transcend state-federal lines; and (2) that the use of an electronic mail and bulletin board system to link state health and environmental agencies agencies together and with the relevant federal agencies will greatly improve the responses to day-to-day problems in the areas of toxicology and the environment.

In summary, the Steering Committee has identified from the Workshop three categories of state needs for toxicology and environmental information and data resources:

1. Improved methods for rapid, informal inter-state and state-federal communications.

2. Improved access to existing databases.

3. Coordination/collaboration in database building.

Recommendations of the Steering Committee. To meet the identified needs of the states, the Steering Committee recommends that an organization--provisionally called the "Coordinating Council for Toxicological and Environmental Data Resources"--be formed. It should be staffed with representatives from states and federal agencies which build and use such data resources, and from states which need access to databases. The Coordinating Council should be organized under an umbrella organization, such as the National Governors Association, that can transcend state and federal boundaries. Over the course of the first year of operation, the Coordinating Council would have the following functions:

1. Improve informal communications--particularly for situations involving responses to questions concerning hazardous chemicals--among state health and environmental agencies and between such state agencies and the relevant federal agencies by:

   - o Adopting the use of a common electronic mail and bulletin board system, such as AMA-GTE's MINET system.

   - o Providing training for the involved agencies in the use of such a system.

2. Improve access by state organizations to existing data resources by:

   - o Identifying the toxicological and environmental data resources which states are most likely to use.

   - o Identifying the obstacles which state organizations now face in getting access to these data resources (e.g., through use of surveys).

   - o Facilitating such access by developing methods to overcome organizational obstacles, by arranging training and education, by negotiating reduced access fees, and by publicizing case studies of improvements in service brought about by increased use of these data resources.

3. Coordinate the building and improvement of data resources by:

   - o Undertaking a more complete assessment of information and data needs and of existing data resources, including identification of the data and information now lacking in existing data resources.

   - o Facilitating the implementation of agreements among state and federal agencies concerning cooperative data resource building and in-

formation delivery. These should include agreements on such topics as: database structure and content; data sources; online retrieval systems; alternative data output methods; quality control and quality assurance, etc.

The Steering Committee estimates that the organization which will create and maintain the Coordinating Council (i.e., the National Governors Association or some other suitable organization) will need, over the course of a year, resources of approximately $75,000 for support of one full-time staff person, travel funds for Council members to attend meetings, and overhead. This resource level assumes a certain amount of "volunteer" labor by Council member organizations for performing the necessary surveys and studies. However, it is the responsibility of the states and the federal agencies that would benefit from the joint development of these environmental and toxicological information resources to identify the sources of these funds and of future support for a continuing coordinating effort.

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STATE/FEDERAL WORKSHOP

ON

JOINT DEVELOPMENT OF ENVIRONMENTAL AND TOXICOLOGICAL INFORMATION RESOURCES

SUMMARY AND PROCEEDINGS

May 28-29, 1985

at the

National Library of Medicine
Lister Hill Center Auditorium
8600 Rockville Pike
Bethesda, Maryland 20894

sponsored by

The National Governors Association

in partnership with

The National Library of Medicine

The Environmental Protection Agency

The Centers for Disease Control

The Association of State and Territorial Health Officials

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State/Federal Workshop on Joint Development of Environmental and Toxicological Information Resources

Report of the Steering Committee

Background. The need for coordinated, readily accessible information about toxicology and the environment is ever growing. Several state and federal organizations have been building, or are planning to build, computer-based databases describing the chemical, physical and biological properties of hazardous chemicals. In most of these projects, the chemicals and properties under consideration are similar. Since database building and maintenance are resource intensive efforts, coordination and collaboration among these organizations can lead both to savings for the builders and to improved services for the users of these databases. Informal discussions about sharing among the builders and potential builders of these databases led to the organization of a *State/Federal Workshop on the Joint Development of Environmental and Toxicological Information Resources.*

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Findings. There was near universal agreement among Workshop participants that greater cooperation in the future among state and federal agencies who are building, or planning to build, databases would greatly reduce costs and improve information retrieval.

The Workshop discussions also revealed that many states, far from having the luxury of building data resources, face grave difficulties simply in gaining access to the toxicology information that is already available in one database or another. If building a cooperative database is the long-term goal of this community, then solving the "access problem" is certainly an immediate goal.

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Recommendations of the Steering Committee. To meet the identified needs of the states, the Steering Committee recommends that an organization--provisionally called the "Coordinating Council for Toxicological and Environmental Data Resources"--be formed. It should be staffed with representatives from states and federal agencies which build and use such data resources, and from states which need access to databases. The Coordinating Council should be organized under an umbrella organization, such as the National Governors Association, that can transcend state and federal boundaries. Over the course of the first year of operation, the Coordinating Council would have the following functions:

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STATE/FEDERAL WORKSHOP

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JOINT DEVELOPMENT OF ENVIRONMENTAL AND TOXICOLOGICAL INFORMATION RESOURCES

SUMMARY AND PROCEEDINGS

SUMMARY OF THE WORKSHOP

On May 28-29, 1985, the National Governors Association (NGA), the Environmental Protection Agency (EPA), the National Library of Medicine (NLM), the Centers for Disease Control (CDC), and the Association of State and Territorial Health Officials together sponsored a State/Federal Workshop on the Joint Development of Environmental and Toxicological Information Resources. The purpose of the Workshop was to consider the possibilities for collaboration among federal and state organizations that either build, or sponsor the building of, data resources in the areas of toxicology and the environment.

HISTORY

The Workshop is an outgrowth of the State Integrated Toxics Management (SITM) Project, which is funded under a cooperative agreement between NGA and EPA. An April, 1984, SITM conference on the subject of "Prevention Tools in Toxics Management" brought together representatives of the states and EPA to discuss the databases that were available to states and how the states might use them. Following this conference, several states, particularly Michigan and California, began to discuss informally with NLM and EPA the possibility of sharing databases, and even of building a cooperative database.

Also following the SITM conference, the Hazard Evaluation System and Information Service (HESIS) of the California Department of Health Services carried out a survey of the toxicology information needs and resources of states and selected federal agencies. A questionnaire was developed and sent to 50 state health

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agencies, 31 state environment departments and to CDC, EPA, NLM and NIOSH (National Institute for Occupational Safety and Health). Over 170 completed survey forms were returned. They indicated not only that states are in general willing to contribute to shared systems, but also that most state agencies need better access to information sources.

It was also apparent that several states were interested in developing their own databases. Later discussions of the Steering Committee revealed that sometimes the states had made their plans without realizing what data resources were already available or how much the endeavor would cost. At times, the funds for these efforts would come from federal grants or contracts, most often from EPA. Furthermore, these new state databases would describe very similar core sets of hazardous chemicals and would report for these chemicals very similar types of biological and environmental effects.

In summary, then, the SITM conference, the HESIS survey and the subsequent informal discussions showed that there were many areas in which the states and federal agencies might profitably cooperate in creating shared information resources.

A Steering Committee (whose members are listed with the Report of the Steering Committee on p. viii) was organized to bring together states and federal agencies in a more formal setting to discuss their common need for information on the toxicological and environmental effects of hazardous chemicals. From the deliberations of this Committee, the Workshop was born.

ORGANIZATION OF THE WORKSHOP

The activities of the two-day Workshop were divided between plenary sessions and three Work Groups, which considered, respectively, the *admin-*

istrative/political, the *database content*, and the *systems* aspects of efforts among states and federal agencies to share toxicological information. (For the complete agenda of the Workshop, see Appendix A.) Dr. Gib Parrish, of the National Institute for Occupational Safety and Health (at the time of the Workshop on assignment with the California Department of Health Services) chaired the plenary sessions.

The following papers were presented at the first plenary session: A. Alan Hill, Chairman of the Council on Environmental Quality, delivered the keynote address for the Workshop on the role of research and development in improving information resources. Elinor Blake of the California Department of Health Services reported the results of the HESIS survey. Richard Powers of the Michigan Department of Natural Resources presented the states' perspective on the building of a cooperative database. Paul Fuschini of EPA's Office of Toxic Substances described EPA's databases. George F. Hazard of NLM's Specialized Information Services described NLM's databases.

In the last presentation, Henry M. Kissman of NLM outlined, for consideration by the Work Groups, four options for data sharing in the relevant subject areas:

> *Option A. the Status Quo*, in which there are no cooperative efforts and each organization fends for itself in seeking the information it requires.
>
> *Option B. a Master File*, in which there is close and sustained cooperation among organizations in building a single database with toxicological information.
>
> *Option C. an Umbrella System*, in which data files are built and maintained separately, but are made available through a single delivery system.
>
> *Option D. Gateway Technology*, through which users of online systems would have available to them access technology that allows easy searching of different files residing in various computers and employing different query languages.

Each of the three Work groups considered these options in their separate deliberations on the afternoon of the first day.

On the morning of the second day the Workshop met again in plenary session to hear the preliminary findings of the Work Groups. After agreeing on the direction in which further discussions should go, the Work groups returned to their separate deliberations.

The Workshop reconvened in a final plenary session on the afternoon of the second day to hear the reports of the Work Groups and to decide upon a course of action for the future.

WORK GROUP FINDINGS

There was near universal agreement that greater cooperation among state and federal agencies who are building, or planning to build, databases would greatly reduce costs and improve information retrieval. Thus, the *Status Quo* option of no formal collaboration was considered unacceptable. Each Work Group found that if the administrative problems did not appear insurmountable, the *Master File* was the desideratum. Given the administrative problems, however, the *Umbrella System*, or some variation of it, was the option to be pursued (though the Systems Work Group saw advantages in the *Gateway Technology*). The Work Groups also concluded that whatever system is ultimately developed for the future, *there is, in the present, a crying need among states for training and for other assistance in gaining access to existing resources.*

There was consensus on two other subjects. First, whatever form cooperation on database building takes among states and federal agencies, *the effort will require coordination through an organizational structure that can transcend state-federal lines.* The *Gateway Technology* would require some minimal coordination, at

least, in order to allow for access to all the diverse databases and computer systems. The *Umbrella System* would require coordination in maintenance, access and training, among other things. A variation of the *Umbrella System*, called the *Network of Files* by the Database Content Work Group, would also require extensive coordination in file building and delivery. The *Master File*, of course, would require close collaboration among many organizations in its building, maintenance and delivery.

Second, *there is a need for much better communication among health and environmental departments in states and with relevant federal agencies to improve responses on day-to-day problems.* It was found, almost as a byproduct of the Workshop, that states need better, faster, more informal means of communicating information on issues related to toxic substances. Many of these needs could be met through the use of one of the widely available commercial electronic mail and bulletin board systems. Access to such a system would allow states to post queries to each other and to share information among themselves and with federal agencies.

CONCLUSIONS

Upon considering the results of the Workshop, the Steering Committee found that it served a second purpose, beyond the stated purpose of bringing together those states and federal agencies interested in building a cooperative database. The Workshop revealed that many states, far from having the luxury of building databases, face grave difficulties simply in gaining access to the toxicology information that is already available in one database or another. If building a cooperative database is the long-term goal of this community, then solving the "access problem" is certainly an immediate goal.

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In summary, as a result of the Workshop, the Steering Committee has identified three categories of *state* needs for toxicology and environmental information and data resources:

1. Improved methods for rapid, informal inter-state and state-federal communications.
2. Improved access to existing databases.
3. Coordination/collaboration in database building.

RECOMMENDATIONS OF THE STEERING COMMITTEE

(For the Recommendations of the Steering Committee, see p. v-vii of the Report of the Steering Committee.)

KEYNOTE ADDRESS:

IMPROVING THE ENVIRONMENTAL DATA BASE

by

THE HONORABLE A. ALAN HILL

Chairman, Council on Environmental Quality
Executive Office of the President

Good morning. It is a pleasure for me to be with you today. I commend you all--the National Governors Association, the Association of State and Territorial Health Officials, the National Library of Medicine, the Environmental Protection Agency, and the Centers for Disease Control--for your joint efforts in putting this conference together.

As professionals committed to the preservation of our environment and to the protection of public health, you are to be applauded for the part you have played in continuing our progress to protect present and future generations from the adverse health effects of chemicals and other potentially hazardous materials.

One underlying theme of this conference is "information"--information developed through research, monitoring and the contribution and maintenance of accurate databases. I am reminded of a story which appeared in the *Chicago Tribune*:

> Abraham Lincoln was vastly disturbed during the Civil War because he was often denounced and criticized by people who pretended to be wise on a minimum diet of facts and information. They offered wisdom they did not possess. So, whimsically he told the story of a backwoods traveler lost in a terrific thunderstorm. The rider floundered through the mud until his horse gave out. Then he stood alone in the middle of the road while lightning streaked and thunder roared around him. One crash seemed to shake the earth underneath, and it brought the traveler to his knees. He was not a praying man, but he made a petition short and to the point: "O Lord, if it is all the same to you, give us a little more light and a little less noise."

The point is, we cannot give light or wisdom we do not have, and we do more damage than good when we speak with authority from a vacuum of knowledge and information.

In order to remove that vacuum, we need to begin at the beginning, and that is with research--research which spans as great an amount of time and covers as many critical areas of concern so as to be useful and effective.

Accordingly, the Council on Environmental Quality, at the request of the Environmental Protection Agency (EPA) and with the assistance of the National Science Foundation (NSF), convened a series of four two-day scientific and technical meetings in the Fall of 1984 to address specific clusters of long-term environmental research and development (R&D) topics and to discern major scientific issues warranting enhanced government or private sector attention during the remainder of the century. At each meeting, a panel of experts discussed a set of four substantively interrelated research topics and associated topic groupings, each of which was originated through consultation with federal agencies. Panelists included public and private sector representatives.

Overseeing this activity was an interagency subcabinet Committee on Long-Term Environmental Research, which I chaired. Support for the effort was provided by NSF, EPA, the Department of Energy, the National Institute of Environmental Health Sciences, and the Nuclear Regulatory Commission.

Long-term environmental R&D includes three kinds of activities: (1) anticipatory research, designed to identify potential environmental problems before they occur; (2) investigations of a continuing nature, such as ecological baseline studies or epidemiological studies, which may require several years to complete; and (3) fundamental research, the output of which may advance basic understanding of health- and environment-related processes.

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Scientists knowledgeable about health and the environment recognize that manmade pressures placed upon natural resources, both living and nonliving, are more severe than previously suspected.

During the past 40 years, a wide variety of new synthetic chemicals have been introduced, some of which appear to pose serious acute and chronic health effects. Of similar concern is evidence of potential damage to such important natural processes or properties as biogeochemical cycling or biologic diversity.

Ignorance about many scientific questions has resulted in acknowledged problems of environmental management, such as inappropriate regulation in the face of data uncertainties or heightened public anxieties. Long-term environmental and health research is needed to resolve scientific uncertainties, to establish baseline health and environmental parameters, to overcome lack of understanding of the short-term variation in natural systems, and to identify long-term trends and relate them to their causes.

For a variety of reasons, current incentives for private sector and governmental support of environmental and health R&D favor short-term approaches. Government agency research programs are generally designed to support mission goals of the agencies sponsoring them, resulting in relatively short-term research planning horizons that do not extend beyond immediate regulatory or programmatic requirements. Similarly, corporate research efforts frequently support near-term product development strategies and are necessarily reflective of annual (or shorter) profit and loss statements. Current government and public concern over such environmental problems as acid deposition phenomena illustrates the fallacy in continued reliance on short-term research design. Although the potential environmental and health effects of acid particulates were pointed out years ago, relatively little research attention was devoted to following up on early studies noting

these effects, and commitment of resources could not be justified on the basis of then current regulatory strategies. Accordingly, long-term acid rain research programs were deferred. Had they been undertaken a decade ago they might by now be yielding information and predictive models of use to current regulators and policymakers.

We believe there is need for a greater resource commitment to, and better direction, coordination and interdisciplinary integration of, long-term environmental and health R&D. Improvements in environmental management will flow from better characterization of environmental phenomena, increased understanding of basic mechanisms, and the development of more meaningful measures of hazard or harm assessment. There clearly is a need for good long-term monitoring data and accompanying quality assurance to evaluate models used for understanding processes and environmental trends. Lack of validated monitoring time series data, based upon even crude health and environmental measures, has impeded the expansion of fundamental research programs.

In addition, modeling can be an integrating force for the environmental research community, in that the imposition of modeling requirements yields helpful insights in identifying needs and opportunities for new research. However, the use of models must be accompanied by continuing efforts to validate them.

Only with research continuing over many years, and for projects that extend over a substantial period of time and that are focused on fundamental issues, will the nation be able to develop the credible and necessary expertise to better rationalize environmental management policies. Environmental science needs a critical mass of talent and resources to approach effectively the challenge of understanding complex environmental and health phenomena.

One of the recommendations made by the panelists is of primary concern to you. It concerns data monitoring, collection and analysis.

Monitoring yields essential current and time series information on the status of environmental systems, information used both for environmental management and for regulatory compliance. The panelists believed that the lack of coordinated scientific procedures account for such problems as nonstandardization of monitoring practices and failure to monitor for parameters of greatest importance or relevance.

In spite of significant efforts expended on the collection of environmental data by a variety of unrelated and uncoordinated state and federal agencies, no adequate system exists for the integrated collection, storage, maintenance and quality control of such data. It was recommended that CEQ foster an evaluation by an appropriate organization of existing physical, chemical and biological monitoring programs (and extant data associated with them) to identify and stimulate research and development on improving the quality and cost-effectiveness of monitoring programs. Particular emphasis should be placed on determining requirements for biological and environmental monitoring, on identifying pollutants such as toxic chemicals for sampling, and on determining information and statistical requirements for environmental models.

In this regard, the Council has addressed the idea of an Interagency Initiative on Environmental Monitoring and Data. There are several compelling reasons to revisit the environmental monitoring issue from a comprehensive, multi-agency perspective. You are all concerned with the collection and sharing of data and the need for better ways to accomplish your given tasks. Recent studies point to the continued need for improvement in the monitoring of environmental trends, and in

the more effective dissemination of information on environmental quality to all concerned organizations and individuals.

In addition, there is clear Congressional interest within the last two years pointing to the need for resolution of monitoring problems, and proposing a national environmental monitoring commission to do what the agencies themselves could be doing. The increasing budgetary austerity that most agencies face argues for the use of common methods, cooperation in monitoring common parameters, standardization of methods, and the pooling of data.

Because of its location within the Executive Office of the President and the Council's responsibilities relative to environmental information, CEQ can effectively serve as the catalyst to encourage multi-agency cooperation in this area. We propose to establish a core group within the Council on Environmental Quality and an oversight committee composed of representatives from federal agencies to undertake such tasks as:

1. Publishing and updating a report on Environmental Trends in the Nation.

2. Identifying an aggregate set of key environmental indicators capable of assessing the environmental health of the nation.

3. For each indicator proposed, recommending an approach for collecting and aggregating data, under which measurements can be obtained regularly and cost-effectively.

You who are in this room today well realize that comprehensive environmental management approaches depend upon the availability of reliable theories, data and expert opinion. Advances in environmental sensors, information processing, transfer of scientific and technical knowledge, and use of environmental databases can increase our ability to manage effectively our environment.

Basic scientific research and monitoring and assessment activities provide useful but voluminous amounts of information that must be evaluated in order to assure its reliability in identifying, resolving or mitigating environmental problems. However, in identifying long-term research and development needs, it is important first to distinguish between research and monitoring; that is, between studies that attempt to improve our understanding of how environmental systems work, and studies that provide data on the status of those systems. Our basic understanding must guide the choice of what parameters to monitor, and questions of research priorities and quality control must be answered.

In order to improve methods of data analysis and interpretation, a number of additional questions must be answered. For example, how are the large environmental data sets currently maintained by the federal regulatory and management agencies being used? Are they used in state-of-the-art models and analyses which are clearly related to human health and environmental quality, and which reflect our knowledge of how systems work? Are they ever used to improve our basic understanding of how systems work? How many people outside the agencies use the data? What are the problems and impediments in using and interpreting the data? Has basic knowledge about the working of the systems being sampled been used to increase the efficiency of sampling and the utility of the data in detecting trends?

Through your efforts in the development of environmental and toxicological information resources, you can help evaluate the cost-effectiveness of previously implemented programs, while identifying where additional efforts are needed, thereby determining where funds need to be allocated. You are able to assist in the promotion of new programs by substantiating the effectiveness of other similar programs and to justify budget requests for these programs.

Last, but certainly not least, you are providing a valuable repository of necessary information which is becoming increasingly more accessible for those whose jobs, and even some whose live depend upon your knowledge and expertise.

I congratulate you on your successes and wish you the best for the future. Please accept my best wishes for a productive Workshop. Thank you.

TOXICOLOGY INFORMATION NEEDS AND RESOURCES IN STATE AND FEDERAL AGENCIES:

Preliminary Results from a Survey Conducted by the California Department of Health Services

by

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The demand for information about the toxicology of chemicals is ever increasing. Public concern about hazardous substances grows with each chemical spill, each newly discovered toxic dump site, and each new cluster of occupational disease cases. At the same time governments are under increasing pressure to undertake toxicologic evaluations and risk assessments. My own program, the Hazard Evaluation System and Information Service of the the California Department of Health Services (CDHS), responds to about 2,000 calls a year. But while the need for information is growing, so also are the constraints on staffs and budgets. In late 1983 the Hazard Evaluation System began to consider ways to streamline its public inquiry response system. Let me describe for you how we at CDHS came to conduct a survey of toxicological information needs and resources, our methodology and our preliminary results.

To improve our own response capabilities, we began to explore online toxicology information systems. Of the six nonbibliographic databases we reviewed, we found Michigan's Chemical Evaluation Search and Retrieval System (CESARS)

and the National Library of Medicine's Toxicology Data Bank (TDB) closest to meeting our needs. We found representatives both of CESARS and of TDB to be enthusiastic about cooperating with us in meeting our database needs.

While we were in the process of evaluating databases, Gib Parrish, M.D., and I attended several conferences put on by the National Governors Association's States Integrated Toxics Management Project (SITM). There we found many state health and environment officials interested in a shared, cooperative database. At the April, 1984, SITM conference, everyone agreed that before anyone set about designing a new database, it would be important to know what information the users needed from it and what resources they could bring to it. We volunteered to conduct a survey of the toxicology information needs and resources of state and federal agencies.

METHODOLOGY

As a preliminary to the survey, we studied the literature on states' toxicology resources. Drs. Sandra Lapham and Stuart Castle of the New Mexico Health Department published a survey in the September, 1984, issue of the *Journal of the American Public Health Association* of the location, staff size and areas of responsibility of state programs in environmental epidemiology. The authors call for an interstate network to allow for timely exchange of information and experience.

In August, 1983, EPA issued "State Integrated Toxics Management: Twenty Profiles" which listed the health and environment program of 20 states which are involved in identifying and solving cross-media toxics problems. The report describes some of the states' organizational strategies, legal authorities, etc., for coordinating toxics activities.

In July, 1984, the Association of State and Territorial Health Officials (ASTHO) published a compilation of environmental epidemiology investigations and a directory of environmental epidemiology staff members. The purpose of the compilation was to increase communication among these state health agency personnel.

With these earlier efforts in mind, we prepared a survey instrument. (See Appendix C.) After circulating it for review among several groups, we mailed it in January of this year to all state health and environment departments, and to EPA, NLM, the Center for Environmental Health (CEH), and the National Institute for Occupational Safety and Health (NIOSH). We wanted to make sure that the survey was distributed properly, so we made a list of the programs in each state that were likely to use toxicology information. We included programs in air, water, hazardous waste, environmental epidemiology, toxics coordination and risk assessment. Where these programs are housed in separate agencies we included air, water and hazardous waste boards. Because of our limited resources, we excluded food and agriculture departments, and occupational health programs in labor departments.

We sent multiple copies of the survey to the 50 state health agencies and the 31 environment departments (and to the federal agencies mentioned earlier). For each agency we enclosed a list of its programs that we had identified. Dr. Donald Lyman, then the Acting Deputy Director of our Department, who is active both in NGA and in ASTHO, wrote a cover letter asking the directors to pass the survey along to the identified programs for completion and to any other appropriate programs.

So far, we have received 170 completed surveys, including at least one from each state, of which we have analyzed 155. Seventy of the responses were from

health departments, 55 from environment departments, 14 from combined health and environment departments, and 16 from boards or other agencies. The distribution of response is fairly uniform by program activity. We received about 20 responses each from air, water and environmental epidemiology programs, and about 15 from waste programs. Another 40 were from programs which combined more than one of those activities or which served as a general toxicology resource for several programs. Because some departments chose to combine the responses of several programs into one survey form, the total response to the survey represents many more than 170 individual programs.

ANALYSIS

Introduction. The survey was designed to present a broad picture of the state programs which respond to inquiries about toxicological and environmental problems: the number, subject and origins of the inquiries the programs receive; the kind of staff the programs have; their resources in literature, computer databases and computer hardware; the specific chemicals about which they receive the most inquiries; and the types of information about chemicals which the programs need in order to respond to inquiries.

A few words of caution about the tabulations that follow:

1. Analysis has been complicated by the fact that some responses represent a single program while others represent more than one program.

2. Some responses did not include answers to all of the survey questions, so the total number of responses varies from question to question.

3. The survey questions cover a wide range of topics, from toxicology to computer hardware. The accuracy and detail of answers to some of the questions may vary with the background and expertise of the person or persons responding.

4. We received eight responses from some programs which are outside the scope of the survey. We have included these responses in the preliminary tabulation because the programs were asked to respond by their departmental directors. For the most part, they are laboratory programs.

Needs. The survey indicates the magnitude of the information requests which our programs receive every day. Respondents report receiving nearly 80,000 requests for toxicology information every year, or more than 1,500 a week. (This number, incidentally, does not include the 250,000 annual requests for information reported by one program in the New York State Health Department.)

As you can see in Table 1, requests for information are distributed fairly broadly by topic, although general environmental information leads the field, followed by pesticides and information concerning standards or permits.

TABLE 1. Requests for Information Concerning Chemical Toxicology, By Topic*

Total # of Requests[1]	% of All Requests[2]	Mean % of Requests[3]	Topic of Request
21648	27	15	general environmental
17057	22	12	pesticides
16428	21	14	standards or permits
12375	16	11	hazardous waste sites
11752	15	13	ground water quality
9914	13	8	outdoor air quality
8997	11	5	contaminated food
8966	11	9	hazardous material spills
8160	10	11	surface water quality
7765	10	9	occupational hazards
7302	9	10	risk assessments
4412	6	7	indoor air quality
6070	8	6	methods to reduce exposure
3080	4	5	consumer products
3037	4	4	identification of trade name
3539	4	3	diagnosis and treatment
2291	3	3	poisoning
1072	1	1	pharmaceuticals
1966	2	2	other

*Results from 148 surveys

Note: Since requests may fall into more than one category (e.g., an inquiry about pesticide toxicity in an occupational setting) the sum of the requests is greater than the number actually received (78,884) and the sum of percents is greater than 100%.

[1]The total number of requests is equal to the total number of requests received by each survey respondent multiplied by the percent of requests each respondent reported receiving on each topic. These figures were then summed by topic of request for all respondents.

[2]This column represents the percent of all requests received nationally. It was calculated by dividing the number of requests for each topic by the total number of requests (78,884).

[3]This column represents the mean percent of the requests in each category as reported by the survey respondents. So, for example, general environmental questions comprised 27% of all requests received nationally, but 15% on average of the requests received by each respondent.

But while the topics are distributed fairly broadly, the sources of information requests are not. Table 2 below shows that about 25% of all inquiries come from the general public, far more than from any other group, while all government agencies taken together (local, federal, other state agencies) generate 22% of the inquiries.

TABLE 2. Requests for Information Concerning Chemical Toxicology, By Type of Requester*

Total # of Requests[1]	% of All Requests[2]	Mean % of Requests[3]	Type of Requester
19205	24	29	general public
11796	15	11	companies
7985	10	14	personnel in your program
6284	8	10	other state agencies
4645	6	7	nonstate, nonfederal gov't agencies
3646	5	6	the media
2906	4	4	federal government
2611	3	4	state legislature/Governor
2301	3	3	attorneys
2299	3	4	environmental groups
1823	2	3	private physicians/nurses
1481	2	1	academic researchers
1241	2	1	union personnel
975	1	1	insurance companies
9425	12	4	other

*Results from 148 surveys

[1]The total number of requests is equal to the total number of requests received by each survey respondent multiplied by the percent of each type of requester. The figures were then summed by type of requester for all respondents.

[2]This column represents the percent of all requests received nationally.

[3]This column represents the mean percent of the requesters in each category as reported by the survey respondents. So, for example, the general public made 24% of all requests received nationally, but made an average of 29% of the requests received by each respondent.

Not only is the general public the largest single source of information requests, but three-fourths of all requesters required *general*, rather than detailed, information. Together these two findings highlight the need for more than one approach to the delivery of toxicological information. Health and environmental programs concerned with chemical toxicology are nearly all designed to generate highly technical information--the sort of information required for setting standards, assessing risks, developing policy, and so on. Few resources are allocated--officially, at least--to answering these requests for general information, which make up the bulk of the requests. Perhaps it would be useful to develop not only a cooperative database, but also cooperative fact sheets and pamphlets with which to meet this demand for general information.

Staff Resources. As you can see in Table 3, the 150 respondents who answered the question reported a total of 4,500 staff members, nearly one-fifth of whom were described as environmental scientists.

Since we are here at this conference to discuss the task of building a cooperative toxicology and environmental database, it is worth noting that the 150 respondents employ 69 toxicologists, 65 epidemiologists, 40 physicians, 32 nurses and 18 veterinarians. These 224 staff members are the ones most likely to evaluate animal and human toxicology information. Their number, though not small, is in contrast with the 1875 people--environmental scientists, chemists, biologists, chemical engineers and industrial hygienists--most likely to review environmental and chemical data.

It also bears noting that only 61 staff members, about one percent of the total, are described as health educators or public information specialists. Compare this, then, with the 80,000 requests for information and the three-fold greater need for general rather than detailed information.

TABLE 3. Number of Personnel by Job Title/Function in State and Federal Programs Which Respond to Requests for Information on Chemical Toxicity*

Total for All Programs	Job Title/Function
846	environmental scientist
475	clerical
438	biologist
398	administrative staff
350	chemist
164	chemical engineer
147	wordprocessing technician
96	data entry personnel
77	industrial hygienist
71	computer specialist
69	toxicologist
65	epidemiologist
61	health educator/public info. specialist
40	physician
32	nurse
30	statistician
24	research librarian/info. specialist
18	veterinarian
1110	other

*Results from 150 surveys (including four federal programs)

Note: Of the staff listed who are not computer specialists, 241 were described as being able to use a computer.

Information Resources. The survey found that programs have access to numerous toxicology literature resources. Of the resources listed in Table 4, almost half the respondents have access to two-thirds or more of the resources. Overall, general texts and journals are commonly available.

TABLE 4. Literature Resources Available Within One Day to State and Federal Programs Which Respond to Requests for Information on Chemical Toxicity*

Total Respondents with Access[1]	Resource
122	general textbooks on toxicology
111	toxicology and related journals
102	library--off site
98	library--on site
98	indexes and abstracts (e.g., Biological Abstracts, Index Medicus)
96	NIOSH Registry of Toxic Effects of Chemical Substances (RTECS)
93	technical reports
88	Chemical Abstracts (published by Chemical Abstracts Service)
86	chemical profiles (e.g., Material Safety Data Sheets)
83	journal articles (clipped, organized and filed)
83	Documentation of TLVs (published by the American Conference of Governmental Industrial Hygienists)
80	NIOSH criteria documents
80	Patty's Industrial Hygiene and Toxicology
74	NIOSH Current Intelligence Bulletins (CIBs)
52	International Agency for Research on Cancer (IARC) Monographs

*Four federal programs are included in this preliminary tabulation.

[1]Results from 147 surveys. The median number of resources per respondent was 9.

As you can see in Table 5, about two-thirds of the respondents use at least one computerized database. NLM's MEDLARS is the most popular choice, followed by CIS and DIALOG.

TABLE 5. Computerized Information Delivery Systems Used by State and Federal Agencies Which Respond to Requests for Information on Chemical Toxicity*

# of respondents[1]	Computerized Information System
53	No system used
53	MEDLARS
36	Chemical Information System (CIS)
33	DIALOG
24	Chemical Abstracts Service (CAS) Online
17	Bibliographic Retrieval Service (BRS)
14	Occupational Health Services (OHS)
48	other

*Four federal programs are included in this preliminary tabulation.

[1]Results from 143 surveys.

As summarized in Table 6, about half the respondents use at least one non-bibliographic toxicology database, primarily online. RTECS is the most common, followed by OHM-TADS and TDB.

TABLE 6. **Factual, Nonbibliographic Chemical/Toxicological Databases Used by State and Federal Agencies Which Respond to Requests for Information on Chemical Toxicity***

# of respondents reporting use[1]	Database Used
68	none
	Online:
44	Registry of Toxic Effects of Chemical Substances (RTECS)
30	Oil and Hazardous Materials--Technical Assistance Data System (OHMTADS)
27	Toxicology Data Bank (TDB)
22	Hazardline
18	Clinical Toxicology of Commercial Products (CTCP)
15	Chemical Evaluation Search and Retrieval System (CESARS)
12	other
	Offline:
14	database developed inhouse
10	Poisindex
4	Chemtox (Resources Databases, Inc.)
5	other

*Four federal programs are included in this preliminary tabulation.

[1]Results from 139 surveys.

For the purposes of this conference, these last two Tables lead to an important conclusion: There are many state programs which do not use any computer-based information at all. Nevertheless, online access is the preferred means of obtaining information from other state and federal programs, although, as Table 7 reveals, the mail and the telephone are also strong choices.

TABLE 7. Preferred Method of Receiving Toxicology Information Created by Other State and Federal Programs*

Overall Score[1]	Communication Medium
472	online, via computer
398	written, by mail
371	phone consultation
271	floppy diskettes
178	electronic mail
11	other

*Results from 139 surveys.

[1]Overall score was determined by multiplying preference by a factor (first choice=5, second=4, third=3, etc.) and then summing these for each type of medium.

Most respondents have access to some kind of computer equipment. As summarized in Table 8, two-thirds are able to communicate between computers. Two-thirds have access to a microcomputer. And recall from Table 3 that respondents report more than 300 staff members capable of using a computer.

TABLE 8. Computer Equipment Readily Accessible to State and Federal Agencies Which Respond to Requests for Information on Chemical Toxicity*

# of respondents with access[1]	Type of Equipment
100	microcomputer
93	computer-to-computer communication facility
77	mainframe computer
76	dumb terminal
54	intelligent terminal
50	minicomputer
19	other

*Four federal programs are included in this preliminary tabulation.

[1]Results from 142 surveys.

As a final question regarding information resources, we asked whether any state programs were planning to develop their own toxicology database. Thirty-four responded that they are, but review of these projects suggests that most are designed for strictly local needs.

Content. Table 9 lists the general types of information about chemicals for which respondents report a need. (For a ranked list of chemicals about which respondents receive inquiries, see Appendix D.) Most respondents report a need both for highly technical information on chemistry, physics and toxicology, and also for information on use and production, safety and handling, and environmental fate and monitoring. But many states need some types of information than they do others, a fact which may be of use in the future in allocating resources to enhance data records.

TABLE 9. Categories of Information Used in Reviewing the Physical, Chemical and Toxicological Properties of a Chemical

# of respondents[1]	Information Category
129	acute toxicity, human
127	substance identification
127	exposure standards and regulations
127	physical and chemical properties
124	environmental fate/exposure potential
123	carcinogenicity
120	subacute/chronic toxicity, human
113	acute toxicity, animal
112	manufacturing and use
109	mutagenicity
107	teratogenicity/reproductive effects
102	subacute/chronic toxicity, animal
99	monitoring and analysis methods
96	safety and handling
79	acute toxicity, aquatic
71	subacute/chronic toxicity, aquatic
65	metabolism
52	pharmacokinetics
20	other

[1]Results from 147 surveys

Summary. Our preliminary analysis of the responses to the survey reveals four points for this conference to consider:

1. Of the 80,000 requests for information which respondents report receiving, approximately one-fourth come from the general public and three-fourths require only general information in response. There is clearly a need, then, for a variety of approaches to providing toxicological information in order to meet this demand for accurate but less technical information.

2. Among the programs which responded to the survey, there are more than 2,000 staff members who, by their expertise, are potential contributors to a shared database.

3. Approximately one-third of the programs which responded to the survey do *not* now use a computerized information delivery system.

4. Nearly all of the programs which responded to the survey have ready access to computer equipment and two-thirds of them have computer-to-computer communication capability.

One final note. In the survey we asked two questions of vital importance for the development of a cooperative, computerized toxicology database. First, respondents reported overwhelmingly that they would use information created by other states and by federal agencies. Second, more than half of the respondents--76 in all--replied that they would contribute information to such a system. There is solid representation here from those 76. I hope that this survey will be of assistance to the conference.

Thank you very much.

ELEMENTS OF A COOPERATIVE DATABASE:

THE STATES' PERSPECTIVE

by

RICHARD POWERS

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Michigan Department of Natural Resources

When I began preparing my talk to you today, I decided to broaden the topic on the agenda, which was to be an overview of state databases, into a discussion of the states' perspective on a cooperative toxicological database. It became clear, when I reviewed the results of the California survey with Elinor Blake this past week, that state toxicological databases are nowhere near as sophisticated as those available from private vendors or from the federal government.

States have a tremendous need for a good toxicological database if they are to do their job in regulating chemicals. But there is as of now no single database which meets that need. By the same token, states don't have the resources, the time or the personnel to develop databases of their own. I say this on the basis of Michigan's experience both as developer of a database and as regulator of toxic chemicals on a day-to-day base.

And yet we must always bear in mind that the states will be the primary users of any cooperative database we develop because it is the states which receive the bulk of the information requests about toxic chemicals. The states, then, should have a large say in how this cooperative database should be designed. Here are my thoughts on the elements that this database should include.

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The first and most important task in developing a cooperative database is to match the types of information in the database to the uses to which that information will be put. These uses are fairly standard for the states--and for the federal government, too, for that matter. The primary information need is for standard setting to support toxic chemical regulatory programs. Without solid data we cannot substantiate regulations against court challenges. But we also need information for environmental permit development; for public information; for cleanups; for risk assessments; and finally for general problem evaluation and response to such things as spills and accidents.

In order to support these activities we need information on toxicity in general; on acute/chronic problems; on carcinogenicity; on mutagenicity; on teratogenicity for humans and mammalian organisms, and for aquatic organisms when regulating surface water contamination; on pharmacokinetics and metabolism; on hazards such as corrosivity, flammability, explosiveness, reactivity--information which is particularly important in hazardous waste regulatory programs. We also need information on environmental fate, which would include the physical/chemical properties of the chemical substances, bioaccumulation, degradation, and so on. This information has been overlooked for the most part in database development--and in regulation of chemicals, I might add--but it is vital for developing realistic exposure scenarios. A final area of information that should be included in the database concerns existing regulations, tolerances and guidelines that have been promulgated by state and federal agencies. It would be helpful for a state to know how others are regulating chemicals when it is in the process of developing its own standards.

The future information needs of the states will be much the same as the needs we have today, only more so. We will need data on more chemicals, and we

will need more data on chemicals, particularly in those areas which, as I said, are not now well covered, such as environmental fate.

With these information needs and uses in mind, let me review for you the data systems that the states have produced. I am using here information that Elinor Blake has supplied to me from the California survey. It's obvious from the survey that more than a few states are interested in developing data systems. Some twelve states reported that they have some type of data system in use, that they were currently working to develop one, or that they planned to put one into effect soon.

Several states, such as Minnesota, California, Michigan and Tennessee, have libraries of reference materials. Several other states, such as Florida, Louisiana, Rhode Island and New York, have limited databases, which generally are very specific to a topic and include just a few categories of information. Also, several states, such as Massachusetts, Texas, North Carolina and New Hampshire, have more extensive data compilations. These systems still tend to be brief and limited to a specific area of interest, but they contain more items information and many are being computerized.

And finally, let me use Michigan as an example of a state that has developed a fairly comprehensive compilation of chemical information. Our effort takes three primary directions.

First, we have a library of technical reference materials, which currently contains about 6,000 books, documents and reprints. We're implementing a computerized library system on an IBM-PC using a software package called "Nutshell." (I mention this for anyone interested in this type of library system. Feel free to contact us. We'd be glad to show you what we are doing.) At the moment we are en-

tering articles by author, title and CAS number, but in the future we want to include a subject category.

Second, we have a chemical evaluation file, a compilation of data on chemicals which is kept in a manual file system. Each file contains several pages of information on toxicity and on environmental fate that we've gathered on various chemicals. So far, we have files on more than 2,000 chemicals. The quality and quantity of the data varies from chemical to chemical because, unfortunately, we have no formalized quality control program. Generally this information has been gathered for a specific issue or problem to which we've had to respond.

Third, we have the CESARS (Chemical Evaluation Search and Retrieval System) database. CESARS is a computerized database which currently contains files on 194 chemicals. There are files on an additional 21 chemicals that are almost ready to go onto the system, and files on 50 more for which evaluations have been completed but which have yet to undergo quality control and final editing. Soon, then, there will be somewhere in the area of 260 chemicals in the system. In general, these are the chemicals that we've faced most frequently, and I think you will find that they are the ones that most state and federal agencies encounter on a day-to-day basis in their regulatory programs.

CESARS used to be on the Chemical Information System (CIS) before CIS went down. I'm happy to report to you that we have negotiated a contract with NTIS for distributing the database to interested vendors. We think at least two vendors will pick CESARS up. It should be available to the public again within the next couple weeks.

Each state, I think, follows a similar path in developing a computerized data system, perhaps because each begins with the same--unmet--need: to have the

necessary information readily available in a format that allows easy access and manipulation. Michigan began some years ago with only a set of secondary references that we could run to when we needed to answer a question. From this we progressed to a simple manual file system and then to our computerized data system. Let me relate some of the problems that a state will face in developing its own computer system.

The biggest problem for a state is securing resources for the database. At least this has been our biggest problem in Michigan. Much of our CESARS database was developed with the assistance of the Environmental Protection Agency and its Region V Great Lakes National Program Office. The reason why it is so difficult to secure resources is the budget process. There is, for example, almost a phobia about computer systems in the Michigan legislature. These systems must go through their own separate budget process, which makes it doubly difficult to get them funded.

It is also difficult to quantify the benefit of the database. You might be able to say, for some of your activities, that you responded to ten problems during the fiscal year, which is the sort of number budget analysts like to hear. On the other hand, if you say that you can *prevent* a lot of problems with a good database, there is no meaty number for the budget analysts to chew.

Similarly, it is difficult to guarantee long-term support for a database, and long-term support is most important. It is of no use to anyone to develop a database and then fail to keep it up to date and available to users. You need long-term support so that you know you will be in the database business for a long time and can carry out a long-term plan. The problem is, a state's budget process is generally rather flexible. When a downturn comes--which for Michigan might be another downturn in the auto market--it is easy to cut "fat," and databases look

overweight in times of crisis. The program can still respond to problems and can still get permits out, the thinking goes; it just won't have the "luxury" of good data.

It is difficult for states to hire highly qualified staff with the proper expertise for developing and maintaining a database. Building a database takes a large, diversified and expensive staff. By the same token, it is difficult to keep your professional staff working exclusively on a database. Toxicologists and aquatic biologists, I suspect, have better things in mind than going to the library, gathering data, and then writing it up and quality controlling it. We in Michigan have found it difficult to keep people motivated who are spending a large portion of their time on database activities. We've had to spread the burden around so that everyone does some work on the database and still has an opportunity for more challenging work.

It is difficult to justify to a state legislature the need to make a database generally available. Michigan wants to know why it should pay to make its database available to California? The focus is very narrow.

Finally, it is difficult--dare I say it--to deal with the federal government. It is difficult to find someone in a position to make a decision. It is even difficult to find out what is available in the way of databases. Sometimes you learn about an obscure database only by word of mouth. And sometimes it is difficult to gain access to a database. Many bureaucratic impediments prevent a state from getting access to the information it needs.

I have developed a set of criteria with which to judge how useful a database will be to the states. The database must:

1. Be easily accessed by phone.

2. Be easy for people who aren't computer specialists to use--"user-friendly" is the term computer people like to toss around.

3. Have a full range of search and sort options, so that the required data can be picked out of the database and put into a format that people can use in regulatory affairs.

4. Contain actual data, not bibliographic citations. It takes too long to track down bibliographic citations; they're just not that useful. The database should cover the basic categories on toxicity and on environmental fate that I mentioned earlier.

5. Be accessible through a single system of some kind if there is to be more than one database. Getting out of one system and into another again and again is frustrating and time consuming.

6. Contain the chemicals most frequently encountered. These may be the ones on the list developed by the California survey, but one way or the other it will be a priority for this conference to develop a "must" list of chemicals for the database.

7. Be complete in the information recorded for each chemical, or at least representative of what's in the literature. There is such an extensive literature for some chemicals, like PCBs, for example, that it becomes redundant to record each one of, say, 50 LD-50s.

8. Be updated on a timely basis. I cannot stress enough the importance of maintaining the resources for keeping the database current.

9. Be structured so as to allow new chemicals to be added to the database. Our list of priority chemicals is going to change over time as new compounds are created. There must be room to include these new chemicals in the database.

There are many barriers which stand in the way of a cooperative database: politics, bureaucracy, the budget process, "turfitis," or protecting your castle, as was mentioned earlier. But a coordinated, cooperative effort is all the more important precisely because these barriers exist. At the moment there are many databases which are just the slightest bit different, but hardly different enough to justify a place for each of them. If we ever get to the point where we can spend efficiently and effectively all the funds we are now putting out for databases, we can have a database that will be useful to everybody.

But if we are to have a coordinated, cooperative database, there must be some kind of "mechanism" to oversee its development and to shepherd it into being. For my part, I believe that the federal government should have the lead in that mechanism. (It may seem strange to hear a state official say that, but I do think there is a place for the federal government in the scheme of things--usually not what they think their place is, but there is a place.) Federal agencies have the same information needs as the states, and the states themselves have a common need--none of us would be here otherwise. From the standpoint of commonality, then, this is a federal activity; however, perhaps the most important reason is money. If the money is to be found for a cooperative effort, it will be found at the federal level.

Having suggested a federal lead for the project, let me hasten to add that I believe very strongly that the states must be full partners in the project. After all, we will be at least one set of the primary users, and it's been my experience with databases both at the federal level and in Michigan itself that the users have to take the lead in the development of a new system. The programmers and the systems analysts and the computer scientists should work with users to identify their needs and then build the system to meet those needs within the constraints of the software. If we let the programmers develop the system for us without clear guidance, we'll find that it's a slick little system, but it won't do what we want it to do. A large part of the cooperative effort, then, will take place between the users and the developers.

I see the mechanism for overseeing the development of this database as something along the lines of a board of directors, with representation from all of the interested parties. This board should have the clout to get the project going and then to keep it going. Michigan stands ready to participate on that board, and

we offer the CESARS database as one element to be included in the cooperative database.

Thank you very much.

AN OVERVIEW OF EPA DATABASES

by

PAUL FUSCHINI

Chief, Chemical Information Branch
Office of Toxic Substances
Environmental Protection Agency

The last time I spoke to a National Governors Association conference, I was part of a very lively discussion about the kinds of confidential information that EPA is prevented by law from sharing with the states. I've only recently managed to have the tomato stains removed from my suit. This morning I'm happy to be able to talk about the many kinds of information that EPA *can* share with the states.

I suspect that many people in state agencies assume that EPA has very little information to share with states because of the confidentiality requirements. In fact, quite the reverse is true. There are four broad categories of information that EPA is ready and willing to share with states: nonconfidential data submitted to EPA by industry; data either collected or developed by EPA through research; reports that have been generated from research or industry submissions; and computerized modeling systems, a few of which states are already using.

I'm going to share with you summaries of 20 EPA information sources that may be of value to state agencies. These sources, some of which are online and some not, contain information on risk assessment, exposure assessment, toxicity, emergency information for spills, unpublished health and safety studies, water

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quality, ambient air quality, chemical identity and production levels, and pesticides.

The Global Indexing System. The Global Indexing System allows quick access to documents and studies collected under TSCA Section 8(d). It covers the 20,000 documents in the OTS public files, which include sanitized versions of confidential business information (CBI) and all TSCA rulemaking records. Soon it will cover more than 4,300 health and safety studies for the 330 or so substances listed under the TSCA Section 8(d) health and safety rule. The data elements in the Global System are primarily bibliographic, and contain entries like the submitter's name and address, document ID, chemical identity through the CAS Registry Number. For the 8(d) studies, one can search either by chemical identifiers or by the submitting company. The contact person is Linda K. Smith of the Office of Toxic Substances. (FTS/382-3757)

The Graphical Exposure Modeling System (GEMS). GEMS was developed for OTS use with both new and existing chemicals to estimate the impact of chemical transport and transformation processes both on environmental concentrations and on population exposures. GEMS has a series of tiered models which can be used interactively: partitioning models are used in the "prescreen" level to predict into which media compartments (air, water, soil, sediment, biota) a substance is likely to concentrate; toxicity screen models are used to indicate the "worst case" concentration for each medium. The contact person is Russ Kinnerson of the Office of Toxic Substances. (FTS/382-3928)

The Oil and Hazardous Materials Technical Assistance Data System (OHM-TADS). OHM-TADS has a collection of data for the assessment of potential or actual dangers associated with discharge of petroleum products or hazardous sub-

stances. It is also a source of emergency information for spill response teams. In addition, OHM-TADS permits identification of hazardous substances and gives some indication of how to handle the material. There are 126 separate data fields in which information about a chemical substance may be found. OHM-TADS is available through the Chemical Information System (CIS). Contact Chemical Information Systems, Inc., 7215 York Road, Baltimore, Maryland 21212. The EPA contact person is Jack Kooyoomjian of the Office of Emergency and Remedial Response. (FTS/382-2814)

Storage and Retrieval for Water Quality Data (STORET). STORET is EPA's computerized database of information on the quality of the waterways within the country, with data useful for water quality management and pollution control. The data are collected from numerous contributing agencies at several hundred thousand locations. For retrieval purposes, these stations can be selected by latitude/longitude coordinates; by state, county or basin designations; or by station identification numbers. STORET has several different output alternatives: tabular listings of data values; statistical summaries of parameter values; various plotting techniques including line printer, water quality mapping, precision plotting of sample values, statistical analyses, or station location plotting. The contact person is Philip H. Lindenstruth, Office of Water Regulations and Standards. (FTS/382-7220)

Scientific Parameters in Health and the Environment, Retrieval and Estimation System (SPHERE). SPHERE is a family of six databases developed by OTS which contains extracted data at the level of the study (there may be several studies per article), rather than a one paragraph abstract of an article. (Rich Powers mentioned earlier how time consuming it is to go back to the bibliographic refer-

ences. The SPHERE databases, then, would be to his liking.) The databases are standardized into one general format with one general search strategy.

The **DERMAL** database includes chemical identification and characteristics, study protocol, test organism details, summary results, dose results and detailed data. It contains 3,699 studies on 655 chemicals from 403 journal articles.

The **GENE-TOX** database has short-term mutagenic and related assays which can be used to compare the performance of mutagenicity assays on a chemical-by-chemical basis. It contains 3,170 records on 3,170 chemicals.

The **AQUIRE** database contains acute, chronic bioaccumulative and sublethal effects data from tests on freshwater and saltwater organisms. It contains 38,780 studies on 1,1912 chemicals.

The **ISHOW** database contains six types of extracted data: melting point, boiling point, partition coefficient (log p), acid dissociation point, water solubility and vapor pressure. It contains 16,633 records and 5,460 unique chemical substances.

The **ENVIROFATE** database, with information on environmental fate, is being developed by the Syracuse Research Corporation for OTS. A subset of ENVIROFATE is now available to the public on CIS. It contains extracted data from several types of tests or observations including log p, Henry's law constant, hydrolysis, photolysis and soil absorption; the content currently is 8,400 records on 452 chemicals.

The **SECTION 8(E)** database contains Substantial Risk Notification Submissions. It includes data on acute, subchronic and chronic toxicity studies as well as on irritation, sensitization, neurotoxicity, reproductive toxicity, teratogenicity, mutagenicity, oncogenicity and aquatic toxicity studies. It also includes physical/chemical properties, environmental and human occurrence/release/fate, emer-

gency incidence of environmental contamination and product contamination data. The database currently contains 3,536 entries on 512 chemicals. The data has been extracted from 339 of the first TSCA 8(e) submissions that contained no confidential business information. The database is currently being tested and, so far, is available only within OTS.

SPHERE will eventually contain additional databases with information on physical/chemical properties, health effects, environmental effects and environmental fate. The contact person is Linda K. Smith of the Office of Toxic Substances. (FTS/382-3757)

The TSCA Inventory. The TSCA Chemical Substances Inventory, mandated under Section 8(b) of TSCA, is a listing of the chemical substances that exist in U.S. commerce. The original inventory was compiled in 1979 using 1977 information. Any substance for which a Section 5(a) PMN review has been completed and for which EPA has received a Notice of Commencement to manufacture or import has been added to the inventory. The inventory is available both as a publication and as an online database called CICIS (Chemical in Commerce Information System). A certain portion of the inventory, I regret to say, is confidential business information and therefore available only to authorized users. There are over 61,000 chemicals listed, and the inventory is updated regularly. Any chemical which isn't listed is, for TSCA purposes, a "new" chemical and subject to EPA review. For each chemical, the inventory contains the chemical identity; a production volume range; the plant site location, including the zip code; whether it is site-limited; and whether the submitter is a manufacturer or an importer. The contact person is Geri Nowak of the Technical Information Center (OTS Library). (FTS/382-3568)

(Let me add that OTS is now in the process of issuing what we've called an inventory update rule. You may have heard of it because we've gotten a lot of attention in the trade press about what we intend to do. EPA anticipates receiving information on about 15,000 chemicals that are still in production in high volume. The rule creates a "trigger" for reporting. If production changes over a two-year period, then the submitter has to report back to us. One of the areas where we're trying to improve our information with the update rule is the actual production level. We're trying to get specific numbers rather than broad ranges as was the case in the earlier inventory.)

The Pesticide Data Management System (PDMS). PDMS contains pesticide studies from registrants of pesticide products and citations from the public literature that were used to evaluate their submissions. It has broad subject matter indexing. Right now, PDMS includes 140,000 documents, with a projection of 200,000 documents by the end of the fiscal year. The database is coming up for online access in the near future. The contact person is Bill Grosse of the Office of Pesticide Programs. (FTS/557-2613)

EPA Chemical Activities Status Report (EPACASR). EPACASR provides a quick overview of EPA Headquarters activities. Entries are listed by CAS Registry Number arranged by regulatory authority and contain information about actions being taken (regulation, risk assessment, pre-regulatory assessment, etc.), the reasons for these actions, and their current status. EPACASR is available both as a two-volume publication updated every 18 months and as a database updated twice a year and available through CIS. The database also contains references to studies performed by the National Cancer Institute, the National Toxicology Program and the International Agency for Research on Cancer (IARC); a catalogue of 1,400 CAS-registered FDA food additive safety profiles; more than 1,500 pesticide active

ingredients with registrations currently in force; OSHA occupational guidelines; and all CPSC review chemicals. The contact person is Linda K. Smith of the Office of Toxic Substances. (FTS/382-3757)

The Exposure Assessment File. EPA's Chemical Coordination Staff has collected and recorded on microfiche all exposure assessments completed by OTS, OWRS, OAOPS, ORD and the Solvents Work Group which are not sensitive and which don't contain confidential business information. There are approximately 120 exposure assessments covering some 90 chemicals. The contact person is James Falco of the Office of Research and Development. (FTS/382-7327) EPA Regional Libraries also have copies.

Intermediate Priority Pollutant (IPP) Documents. IPP documents provide a concise overview of current EPA regulatory and technical information. They were developed by EPA's various program offices on a group of toxic chemicals of intermediate concern and cover 22 chemicals or closely related groups of chemicals. Each document includes the physical/chemical properties of the chemical; health and environmental effects; production, use, release and exposure; regulatory status; recommended criteria and standards; spill clean-up/disposal; and analytical methods. New IPP chemicals are added every year, and documents are updated as needed. The contact person is Larry Rosenstein of the Office of Toxic Substances. (FTS/382-3626)

The Chemical Hazard Information Profile (CHIPS). CHIPS present an overview of the information OTS has on existing chemicals. At the moment there are profiles on some 80 chemicals or groups of chemicals. Each profile contains a narrative report (20-30 pages) which explores the health effects of the chemical, the environmental effects, production, etc. The contact is the TSCA Assistance Office, whose toll-free number is 1-800-424-9065.

The 8(A) (Level A) Information System. The system, which is available on microfiche, contains Preliminary Assessment Information from manufacturers of the chemical listed by the Interagency Testing Committee. Most of this information, I regret to say, is confidential business information, though the confidential information is kept separate from the nonconfidential. The data includes quantity produced, plant site location, potential exposure, potential environmental release, whether the chemical is for industrial or consumer use, and, if sold, how it is used by consumers. At the moment the system contains over 600 submissions on about 250 to 300 chemicals. The contact person is Barbara Ostrow of the Office of Toxic Substances. (FTS/382-3540)

Industry File Index System (IFIS). IFIS links chemicals with the sections of the statutes that regulate the industries manufacturing or importing them, such as the effluent guidelines of the Clean Water Act or the new source performance standards of the Clean Air Act. The system contains more 5,000 chemicals and more than 60 industry categories. Each chemical entry lists the CAS Registry Number; the uses of the chemical within the regulated industry; regulatory status; industry subcategories; affected environmental media; pollution control technology; and a descriptor field which serves as a catch-all for additional information. Each industry entry lists the Standard Industry Classification (SIC) code; industry subcategories; and the regulation statute. The contact person is Linda K. Smith of the Office of Toxic Substances. (FTS/382-3757)

OTS Information Architecture Notebook. This is a reference tool which outlines the information sources used by OTS in gathering information on chemical production, use, toxicity, exposure, disposal, transport, and so on. The Notebook provides the following kinds of information:

1. An overview of OTS functions and their data requirements divided into nine major categories.

2. A brief description of the processes used by OTS to perform its functions, and a listing of data sets developed and maintained by OTS.

3. Concise descriptions of various computerized databases, with a matrix showing the search and system attributes of each.

4. A description of the analytical capabilities developed and used by OTS for estimating physical/chemical properties and for predicting the environmental fate of and the exposure to chemicals.

5. Three matrices that match data categories and subcategories against information resources, one each for bibliographic databases, for nonbibliographic databases, and for handbook/printed sources.

6. A series of matrices matching data subcategories against OTS functions.

The contact person is Henry Lau of the Office of Toxic Substances. (FTS/382-3938)

Chemical Advisories. Chemical Advisories discuss, for chemicals of immediate concern, toxic effects, routes of exposure and alternative methods of reducing risks. They are prepared in response to inquiries, which may come from a company, a public interest group or another agency. Chemical advisories are addressed to the individuals and organizations for whom the information would be most useful. Their purpose is to encourage voluntary safety measures by increasing the awareness of potential risk, and they are used when regulatory control is not appropriate or in the interim while regulatory action is being pursued. The contact is the TSCA Assistance Office, whose toll-free number is 1-800-424-9065.

Section 8(d) Health and Safety Studies. Section 8(d) of TSCA authorizes the Administrator to issue rules requiring chemical manufacturers, processors and distributors to submit copies of their health and safety studies to EPA. (These rules were first published in the Federal Register on September 2, 1982, and are published in the Code of Federal Regulations at 40 CFR Part 716.) OTS has re-

quested studies on health effects, environmental effects, chemical properties, and human exposure.

Water Distribution Register of Organic Pollutants (WaterDROP). WaterDROP contains listings of abstracts and citations to incidents of water pollution, primarily in the U.S. Each citation includes the identity of the organic compounds, the date, the geographic location, the concentration, and details of the analytic techniques used in the identification. WaterDROP is available through CIS. The EPA contact is: U.S. Environmental Protection Agency, Environmental Research Laboratory, College Station Road, Athens, Georgia 30601. (404/546-3187)

Aerometric and Emission Reporting System (AEROS). AEROS consists of two subfiles: Storage and Retrieval of Aerometric Data (SAROAD) and the National Emissions Data System (NEDS). Both are concerned with data on ambient air quality, which is obtained from all fifty states and from five territories of the U.S. Between them, SAROAD and NEDS contain well over 300,000,000 data values, and they are growing at a 12% annual rate. New data are obtained daily, and the subfiles are updated biweekly in a batch process. There are more than 300 fields available for search and retrieval. All fields are coded, and searching is done by code numbers. The contact is: U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Monitoring and Data Analysis Division, National Air Data Branch, MD-14, Research Triangle Park, North Carolina 27711. (919/541-5582)

As you can see, the assumption that EPA cannot share data with the states because of confidentiality requirements is far from true. We have a lot of information, and it is available. I agree with Rich Powers, however, that sometimes it's not very easy to get to, and we're trying to improve that. We've developed a con-

tact within OTS with the TSCA Assistance Office. We have a toll-free 800 number (1-800-424-9065) which is staffed by professionals who can answer technical questions. The office also publishes a bi-monthly newsletter, the *Chemicals-in-Progress Bulletin*, which highlights developments relating to TSCA, includes listings of chemicals under review, and so on. If you have any trouble getting access to the information you need, please don't hesitate to call the 800 number of the TSCA Assistance Office.

Thank you very much.

AN OVERVIEW OF NLM DATABASES

by

GEORGE F. HAZARD, Ph.D.

Chief, Chemical Information Services Section
Specialized Information Services
National Library of Medicine

Let me first describe the general framework of the databases which NLM offers and then those databases specifically concerned with toxicology. The mission of NLM, of course, is to serve as a central resource for biomedical and medical information, only part of which is toxicological information. The computer system that handles the flow of information within NLM is called MEDLARS, the Medical Literature Analysis and Retrieval System. MEDLARS is accessible throughout the United States and in some foreign countries through TYMNET, TELENET, UNINET, and by direct dialing. There are over 2,500 users.

There are two "products" of the MEDLARS system: publications which are photocomposed from the database, such as *Index Medicus*, and online retrieval. There are 20 online files available through MEDLARS by means of the ELHILL retrieval system.

The flagship file in MEDLARS is MEDLINE, which contains approximately 610,000 references to biomedical journal articles published in the current and the two preceding years. The articles are from 3,000 journals published in the United States and foreign countries. There are backfiles covering an additional 4,000,000 references dating from 1966 which are searchable online. Examples of the variety

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of other files in MEDLARS are Bioethicsline, the Health Planning file and the Literature and Clinical Protocol files from the National Cancer Institute.

Also resident within MEDLARS are the files which are of greatest concern to you, the chemical and toxicological files made available through the NLM's Specialized Information Services: CHEMLINE, Chemical Dictionary Online; TOXLINE, Toxicology Information Online; RTECS, the Registry of Toxic Effects of Chemical Substances; TDB, the Toxicology Data Bank; and HSDB, the Hazardous Substances Data Bank, which will become available July 1.

I'll describe each in turn.

Chemical Dictionary Online (CHEMLINE). CHEMLINE is the chemical dictionary file, or source file. It contains chemical names, synonyms, CAS Registry Numbers, molecular formulas, NLM file locators (which show in what other files within NLM a particular CAS Registry Number has appeared), and limited ring information. CHEMLINE allows you to identify a substance or a class of substances, and then points you to another database within the MEDLARS system. It is updated every two months, based on CAS Registry Numbers appearing somewhere in the MEDLARS family of databases, and now contains approximately 630,000 records. This, let me point out, is only about a tenth of what Chemical Abstracts Service has identified since 1965, but CHEMLINE is limited to those chemicals for which we have identified some sort of biomedical information.

Toxicology Information Online (TOXLINE). TOXLINE is NLM's bibliographic database covering the pharmacological, biochemical, physiological, environmental, and toxicological effects of drugs and chemicals. It leads you to citations either in the journal literature, the government literature, or the report literature. TOXLINE is updated every month and now contains approximately 1.7 mil-

lion citations subdivided into three files. Material is drawn from almost 12,000 journals from various sources, such as the Chemical Abstracts Service.

TOXLINE makes extensive use of abstracts in its records. Often you can use the abstract in place of the article. Records are also indexed by CAS Registry Numbers. In fact, NLM has gone to considerable expense to identify the CAS Registry Numbers for citations which did not include them. So you can be assured of getting reasonably complete retrieval when you search by CAS Registry Number.

TOXLINE is created from a number of subfiles. CBAC, or Chemical Biological Activities, comes from Chemical Abstracts Service and accounts for about half the file. Toxicity Bibliography is created from toxicity references in MEDLINE. International Pharmaceutical Abstracts provides information on drugs. HEEP (Health Effects of Environmental Pollutants) is provided by BIOSIS. TOXLINE also contains the old Pesticides Abstracts file, which is now discontinued.

TOXLINE also contains two files that are produced by other federal agencies. The Environmental Mutagen Information Center file, or EMIC, is created at the Oak Ridge National Laboratory by staff who monitor the literature on mutagenesis and DNA damage. The EMIC file is growing at a rate of 3,000 to 4,000 citations per year and now contains some 50,000 citations. The Environmental Teratology Information Center file, or ETIC, is also created by staff at Oak Ridge who monitor the literature for information on birth defects. The ETIC file it is growing at the rate of 2,000 to 3,000 citations per year and now contains approximately 35,000 citations.

Other subfiles in TOXLINE include the Toxicology Document and Data Depository, or TD3, which is a product of the National Technical Information Service, a subfile created by the International Labor Organization (ILO), and a small subfile from the Hazardous Material Technical Center (HMTC).

As you can see, TOXLINE covers a variety of aspects of the toxicological literature.

Registry of Toxic Effects of Chemical Substances (RTECS). RTECS is a factual database. CHEMLINE as a dictionary points to RTECS, which is created by the National Institute of Occupational Safety and Health (NIOSH). NLM regenerates the entire RTECS file every quarter based upon new data provided by NIOSH after first translating it into the text conventions of NLM's ELHILL search software. RTECS records include toxicity data, chemical identifiers, exposure standards, and status under various federal regulations and programs. For example, RTECS will show the lowest LD-50 obtained for a given experimental design. There are now records on nearly 74,000 potentially toxic chemicals, most of which have CAS Registry Numbers. NLM is collaborating with NIOSH to add CAS Registry Numbers to all of the records.

Toxicology Data Bank (TDB). TDB, like RTECS, is a factual database, but it is more comprehensive for the chemicals it covers. In fact, you can think of it as a handbook online. TDB has more than 4,000 peer-reviewed chemical records. It contains chemical identifier, toxicological, pharmacological, environmental, occupational, manufacturing, and use information, as well as physical/chemical properties. Compounds selected for TDB include highly regulated chemicals, high volume production/exposure chemicals, and chemicals exhibiting high toxicity potential. In a very real sense, TDB contains information on a chemical from its birth in a manufacturing plant to its burial in a dump site.

There are eight basic groupings in TDB and 60 data elements within these eight groupings. There is a chemical identifier section. There are excerpts from standard sources. (TDB was created from a list of standard books and monographs.) And, of course, there are actual values: toxicity values for given effect;

pharmacological data for drugs; environmental and occupational effects; manufacturing and use data; physical/chemical properties; and, since 1983, hazardous waste information. (NLM was asked, under CERCLA, to augment TDB for hazardous waste information.)

Hazardous Substances Data Bank (HSDB). Adding hazardous waste information to TDB created some technical problems, and in the end we were led not only to create a new database, but also to develop new software for searching it. TDB records tend to be quite large, and records are limited to 32,000 characters under the ELHILL software on the IBM system. There was, then, an immediate problem with record size when we began to add hazardous waste information to TDB records. But there was also a second problem. Records in TDB are peer reviewed. The answer was to create a new database, HSDB, to operate on a new delivery system, called TOXNET, which allows much larger records.

HSDB similar to TDB, but much more extensive. While TDB records are limited, as I mentioned, to 32,000 characters, there is no limit on HSDB records, and some actually run over 100,000 characters. The data elements in HSDB are similar to those in TDB, but there are more of them, and they are more comprehensive. HSDB will have 140 data elements and ten categories. The information that is in TDB will be found in HSDB, but there will be much more information on safety and handling of hazardous waste; environmental fate; exposure potential; exposure standards and regulations; monitoring and analysis methods; and a section on additional references that might be of use to you. The information that is added to TDB in order to create HSDB will not be peer reviewed, but it will be subject to scientific edit and quality control.

To accommodate the larger records needed for HSDB, NLM developed a new software system, called TOXNET. Beginning July 1, both TDB and HSDB will be

available on this system, and TDB itself will expand from 60 data elements to 94. For the benefit of present users of MEDLARS, TOXNET emulates ELHILL commands. TOXNET will be accessible through TELENET and TYMNET and also by dialing direct, and will be available 24 hours a day, seven days a week. The cost will be comparable to MEDLARS. If you have a code for MEDLARS, you'll be able to get into TOXNET.

Many of you, I'm sure, are regular users of NLM databases, but for anyone else I'll be happy to arrange a demonstration.

Thank you very much.

OPTIONS FOR DATA SHARING

by

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Specialized Information Services
National Library of Medicine

Let me also welcome you today on behalf of the National Library of Medicine and its Toxicology Information Program. We have come together in this workshop in order to explore ways in which federal and state agencies can collaborate in building data resources in toxicology and related areas. It is my function, on behalf of the Steering Group, to outline some of the options for this collaboration.

Let us first, however, look at some of the considerations which govern this kind of information sharing. Beyond the obvious fact that the data resources under consideration all deal with chemicals and their properties, we will be able to share only if the data resources of potential collaborators have certain characteristics in common, of which I want to bring three, in particular, to your attention:

1. Types of chemical substances in the file.
2. Types of sources used for the data.
3. Attributes of the chemicals described.

There are, needless to say, many other characteristics we could single out for consideration, such as formats and computer systems. However, differences in formats

and computer systems can be overcome fairly easily and without great expense with conversion programs. But it is fundamental that there be some kind of agreement on these three characteristics if we are to have any hope of collaborating. Let me illustrate their importance with a few negative examples:

- Data sharing will not be practical if one potential collaborator is interested only in, say, mycotoxins and another only in drugs of abuse.
- Data sharing will not be practical if one group of potential collaborators uses only published documents, such as journals or textbooks, as data sources, while another takes data directly from the laboratory or from monitoring stations.
- Data sharing will not be practical if one group of potential collaborators is interested primarily in physical properties, such as mass spectra, while the other collects bioeffects data.

A practical example of lack of congruence between collaborators would be between an organization, such as a regulatory agency, for example, whose database deals with classified or proprietary data and another organization whose database can handle only open information. Looking at the problem positively, one can state that two or more organizations can, at least in theory, build a collaborative database describing chemicals if they agree on these three characteristics.

There is another point to bear in mind when we consider possibilities for collaboration. We must separate file building and maintenance from file content and delivery. Organizations can be involved in either or both of these activities, and sharing can take place in either or both. However, file building and maintenance are the more expensive activities. Collaborative efforts, therefore, will be more cost effective and will have a greater impact on resource savings, if they occur in the area of file building.

Finally, we must remember that collaboration among file builders does not require commonality in the mission or the objectives of the organizations. Similar

files can be built by different organizations for very different purposes. As an example from the federal level, NLM as an information-providing agency has no difficulty cooperating on file building with regulatory agencies, even though our missions are quite different.

TASKS FOR THE WORK GROUPS

Assuming that there can be agreement among two or more database builders on these considerations, how can one go about sharing? The Steering Committee for the Workshop concluded that, in order to focus the discussion of these problems of sharing, the Workshop should divide into three Work Groups to consider, respectively, the administrative/political problems of sharing, problems of file content, and problems with file building and delivery systems.

Furthermore, we have developed, as a structure for the Work Group discussions, four options, or models, for each of the Work Groups to consider:

> *Option A, Status Quo*: The responsibility for identifying and applying the necessary human and fiscal resources for file development, maintenance and delivery remains with the originating organization. File integrity is the responsibility of the originating organization.

We called this Option "status quo" because it describes the existing situation. We know of no significant collaboration among federal and state agencies in file building in the subject area of this Workshop. Continuing the status quo has implications for the subject area of each of the three Work Groups.

> *Option B, Master File*: A master file is built with the support of several (all?) organizations that are active in this area. There are many contributors to file content. All needed data elements are coordinated, and there is coordination and agreement concerning sources and file building principles. Identity of contributors can be maintained. The master file is maintained centrally, and costs may be shared.

If you view the options I am going to present as a continuum, then the *Status Quo* will be at one end and the *Master File* at the other. The *Master File* will be a single file, built with complete collaboration, with an agreed upon set of chemicals, agreed upon data elements, agreed upon sources, and agreed upon extraction methods. This system would need some form of centralized maintenance, but there could be more than one delivery method. (These considerations--to repeat--are why it is important to separate file building from file content delivery.)

There are several ways of achieving this Option. One organization could build the *Master File* with cost contributions from other organizations. Or, several organizations could build it, with the work overseen by one organization or by some coordinating "directorate." Here, one organization might be responsible for pesticides, another for environmental fate data, and still another for carcinogenesis data. The overseeing group would then bring it all together in a single database. There are also sub-options for delivery: delivery in subsets, on magnetic disks, or in several online systems for diverse online retrieval.

There are, of course, variations in the continuum between no collaboration and total collaboration.

> *Option C, Umbrella System*: A computer system that can offer an array of integrated technologies for building, reviewing and, possibly, delivering access to a variety of independently created and maintained files.

This Option assumes that various organizations which are now building files would continue to do so (and perhaps would initiate other file building projects) but that the product of these file building efforts would be made available in a coordinated retrieval system so that users would have an easier time gathering information. Different organizations could use the same hardware and the same software for file building, as well as for file delivery. This is a realistic model for

a limited number of organizations because the TOXNET system which Mike Hazard described earlier has, in fact, the capability of allowing several organizations to build files and then bring them up for online access under this umbrella system.

> *Option D. Gateway Technology*: Users of online systems would have available to them access technology (such as the mini or micro version of the Chemical Substances Information Network, CSIN) for computer-mediated searching of various files residing in different computer systems, employing different query languages.

This Option presumes the *Status Quo*. If it continues to be the case that different organizations are building different files to be put up in different computer systems, operated by different vendors, then it is possible through "gateway" software (such as CSIN) to build assistance for users so that the chore of pulling information from different files with different query languages into a single report is made easier.

The Steering Committee hopes that the results of your deliberations in the Work Groups will be useful not only to the organizations which are now involved in file building, but also to those, possibly in state governments, which may be planning to enter this arena. Do they start from scratch by themselves? Can they build on what other organizations have already done, perhaps in collaboration with them? Or should they sit back and wait for other state and federal organizations to build the "perfect" system, without having to use their own resources.

As I mentioned before, each of these Options has consequences that should be considered by each of the Work Groups. The Work Groups might develop the pros and cons of each of the Options, and of any variants that may arise. Obviously, we don't want this Workshop to become just another exercise in model building. We are looking to establish realistic methods for collaboration among state

and federal organizations that are engaged--or are planning to become engaged--in file building and/or file delivery.

As we all know, these activities are expensive, and resources are becoming ever scarcer for all of us. It is only common sense, then, to consider how collaboration can help us stretch our thinning dollars further. And bear in mind that collaboration will have the added benefit of improving service for the users we are trying to serve.

We hope that the Workshop will develop useful ideas and recommendations for data sharing that we can bring before the government agencies which have a stake in easier access to complete and reliable information about chemical compounds and their biological and environmental effects.

Thank you very much.

REPORT OF THE ADMINISTRATIVE/POLITICAL WORK GROUP

chaired by

JOAN K. LEAVITT, M.D.

Commissioner
Oklahoma State Department of Health

In carrying out its charge to consider the administrative and political structures which would foster the sharing of toxicological and environmental information resources, the Administrative/Political Work Group first considered the barriers to information sharing. Unless the relevant information is available for sharing among federal and state agencies, there is no point in building a system for sharing.

A major obstacle is the restriction in the Toxic Substances Control Act (TSCA) which prevents the Environmental Protection Agency (EPA) from sharing "confidential business information" with the states. Representatives from EPA in the Work Group made assurances that while there are presumptions of confidentiality in TSCA, the TSCA Assistance Office is committed to sharing as much information as is legally possible with the states.

CONSIDERING THE OPTIONS

The Work Group made an initial review of the four Options which Dr. Kissman outlined at the plenary session:

Status Quo. The *Status Quo* is unacceptable. States with highly developed information resources, like Michigan, may be able to operate unhindered under the current situation, but no state wants to preclude the possibility of sharing.

Master File. The *Master File* is an attractive Option, especially as a goal for the future.

Gateway Technology. *Gateway Technology* may be viewed as a means of evolving toward the *Master File*, but it is not without problems. The Chemical Substances Information Network (CSIN), the currently available example of *Gateway Technology*, is too complicated, in the opinion of some Work Group participants, for the untrained user to operate, and not all that useful even for the trained user. (However, the forthcoming availability of a microcomputer version of CSIN may remove this objection.)

Umbrella System. The *Umbrella System* has some similarity to the *Gateway Technology*. In fact, the two differ mostly in the location of the software: it is located with the user in the case of the *Gateway Technology* on microcomputers and with a central computer in the case of the *Umbrella System*. With the *Umbrella System*, various files would be made available through a central computer system so that they could be "linked" together during search in the manner of a relational database. It would be possible to vary the linkage between files, from no linkage, as is now the case with most vendors, to some linkage, as is the case with the Chemical Information System, to close linkage, as will be the case with the National Library of Medicine's new TOXNET system.

The Work Group concluded that it was not possible, from an administrative perspective, to select from among the Options without first considering the recommendations of the Database Content and Systems Work Groups.

THE NEED FOR A STANDING COORDINATING ORGANIZATION

The common thread which runs through the last three Options is the need for coordination. The Work Group agreed that, whichever of the Options is ulti-

mately selected (so long as it is not the *Status Quo*), there will have to be established some kind of coordinating body--e.g., a standing committee--to oversee development and operation of the shared system. The very idea of sharing implies some means for coordinating among the participants. Membership on this coordinating committee should include the states, as both contributors to and users of the system, involved federal agencies, and possibly other users, such as industry, labor and environmental groups. It was understood that participation on the coordinating committee may have to be limited to those organizations which could afford the costs in time and travel to attend meetings at a central location, most likely Washington. It was agreed that initially NGA, ASTHO, EPA, NLM, CDC, and states such as Michigan and California, and possibly Florida and South Carolina should be represented on the coordinating committee.

The 1965 Report of the President's Science Advisory Committee on "The Handling of Toxicological Information," which led to the founding of the Toxicology Information Program at NLM, was recommended as an example of a cooperative effort in the founding of an information program. Now, as in 1965, there is a much more widespread "need to know" about information in the fields of toxicology and the environment.

The Work Group concluded that this coordinating committee should serve as a process for solving the administrative problems of creating a shared information system, and not as the delivery structure itself. The committee's first and most important task would be to develop a blueprint for cooperation, out of which would come the mechanism to coordinate database building, maintenance and distribution.

THE NEED FOR A COMPUTER-BASED COMMUNICATIONS NETWORK

The Work Group agreed that there should be some means of communicating among the users of the shared information system--the state health and environment departments, and federal agencies. This communications network would be useful not only as a means of relaying information about the development of the database among the interested parties, but also--and possibly more importantly--as a means of raising and answering queries about toxicological and environmental matters, particularly in emergency settings.

There are several computer-based communication networks (which include both electronic bulletin boards and electronic mail capability) in use among state health and environmental departments that might serve as communication channels. The most widely used of these appears to be the AMA (American Medical Association) /GTE MINET system, which is made available to state health departments through the Public Health Foundation. The Office of Toxic Substances within EPA is funding a pilot project to make MINET available to 13 state environmental departments as a means of communicating EPA information. (For further information, contact Erin Shaffer in EPA's TSCA Assistance Office, 202/382-3580.)

The Work Group agreed that it would be most useful to tie both state health departments and state environmental departments to the *same* communications network, and that MINET, at least for the moment, offered the best facility. (See Appendix E for a description of the MINET system.)

MOVING FROM THE STATUS QUO TO THE MASTER FILE

After listening to progress reports from the Database Content and Systems Work Groups, the Administrative/Political Work Group considered the administrative problem of moving from the *Status Quo* to the *Master File*.

It was agreed that perhaps the *Master File* need not be a single file in the physical sense, but rather a "data nucleus" or "master system" made up of different, closely linked database modules. What is important is the quality of the data and the relationships of the data elements in the different database modules to each other. In building the "master system," the umbrella concept may be useful in developing this relationship among the data elements.

Given the proper database structure, it would be possible to combine several existing databases into the nucleus and then to add additional databases as they are developed. Individual databases covering, for example, chemical identifiers and environmental fate could be built and maintained separately, possibly by different organizations, while being made available as part of the nucleus. The coordinating committee (or the administrative structure which it creates) could oversee the development and quality control of these databases. This structure would go the farthest in closing the existing gaps in information and in avoiding duplication. It would also allow the creation of data subsets from the nucleus as needed.

RECOMMENDATIONS

The Administrative/Political Work Group made the following recommendations:

1. Establish a coordinating committee (possibly consisting initially of the same membership as the Workshop Steering Committee) to develop a blueprint for cooperation among state and federal organizations, out of which would come the mechanism to coordinate database building, maintenance and distribution.

2. Develop a stable source of funding for the shared database, since user fees will not recover the cost of its development.

3. Explore the possibility of linking all state health and environmental departments to the AMA/GTE MINET computer bulletin board, which is now available to state health departments through the Public Health Foundation, and to 13 state environmental departments through EPA.

4. Explore the feasibility of building a "master system" (rather than a master file) by integrating a cluster of relevant databases in a suitable retrieval system such as the proposed *Umbrella System*. Component databases would have to be of comparable high quality and have relatable sets of elements.

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REPORT OF THE DATABASE CONTENT WORK GROUP

chaired by

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In carrying out its charge to identify the database content which is of greatest need for the various users of environmental and toxicological information resources, the Database Content Work Group agreed upon the following approach: first, to define as clearly as possible the information needs of the states and the current problems in meeting them; to identify and consider possible solutions; and finally, to evaluate possible solutions and provide recommendations.

STATE NEEDS FOR INFORMATION ON TOXICOLOGY AND ENVIRONMENTAL EFFECTS

There are, at present, several diverse, but at times overlapping, factual databases in the field of toxicology. Since each has its own access method and search strategies, they are difficult to use as a group. Not all chemicals of interest are covered, and those which are, are covered with varying degrees of completeness. None of the databases is kept reliably up to date.

What is needed is an easily accessible, easy to use, up to date source of complete information on the toxicology, physical/chemical properties, environmental fate, and safety and handling precautions for the most commonly encountered (manufactured) chemical substances. This information is needed for two main purposes: (1) to respond quickly to inquiries from the public and from government

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officials, sometimes in emergency situations; and (2) to support regulatory needs. The current information situation does not meet these needs.

Problems

1. Users must search several databases which vary in data content, format, chemicals covered, quality control of data, output format, search routines, etc.

2. Data elements may have the same name in different databases while in fact containing different types of data. There should be standardized definitions for data elements, expressed in the same format and in the same units of measurement.

For the most part, the data elements in NLM's Hazardous Substances Data Bank (HSDB) and in Michigan's CESARS are consistent, with the following exceptions:

- o It would be a great help in using the two databases if acute and chronic toxicity were broken out in HSDB by topic (reproductive, carcinogenic, mutagenic, neurotoxic, and other acute and chronic effects) as in CESARS.
- o Formulators, as well as manufacturers, should be included in the two databases.
- o Trade names, perhaps in the form of a trade name dictionary in a separate linked file, would be help users to identify products about which they receive inquiries.
- o Both databases should include state standards and regulations, especially where they differ from federal standards.

3. Some databases are haphazardly referenced. All statements of fact in a database should be referenced in a standard format which includes the complete citation, so that the original article can be retrieved.

4. New results are often missing from databases--which tend to be static. Data files should be updated regularly and should include the date on which new

information is added to each field, and not simply a single date for an entire record.

5. The data coverage for chemicals varies, but not in any useful way. Some chemicals need greater coverage, others less. There should be developed a list of the top 200-300 chemicals which have the greatest manufacturing volume and use, or the greatest potential for hazardous exposure. For these chemicals, databases should summarize *all* available information from the literature; as of now, the available data is incomplete even for these most common chemicals. (One advantage of a shared database would be to highlight where these gaps in data exist for the common chemicals.) For a second level of chemicals, some 2000-3000, there should be a summary statement of information accompanied by a list of standard references, possibly grouped by topic, that can be consulted for further information. RTECS can serve as the information source for the remaining chemicals in use, for which little is known and where there is less chance for adverse health impact.

6. The reliability of data content--quality control--is too variable. It is good for some databases, poor for others. There should be a set of minimum standards by which to judge database content, which should probably include review by a group of knowledgeable advisors.

7. Databases do not contain enough information on mixtures, or on synergistic effects.

8. It would be helpful if states could gain access to at least some of the confidential business information held by the federal government.

9. The problem of access to data not contained in a single database is most exasperating. The current situation requires not only several accounts (codes) for

access to different systems, but also knowledge--which many users don't have--of different search and retrieval procedures.

10. Output from currently available databases is often redundant, at times difficult to read and not in a consistent format. There should be improved output options, for both screen display and printed copy, perhaps through the use of menus.

11. Many databases cannot be accessed on a 24-hour basis, as can NLM's TDB and HSDB on TOXNET. However, this is not a major problem at the moment.

12. There should be improved help capabilities, including definitions of data elements, directories to content and chemicals, menus, user assistance, and in the event that all else fails, a contact person.

13. Inefficient access and search procedures greatly increase the cost of and time needed for database use.

14. In the interim, it would be helpful to have an online database directory to help users locate sources of information and determine methods of access.

POSSIBLE SOLUTIONS

The Data Content Work Group considered several options to resolve these problems confronting state users of existing databases. The goal of these options, to repeat, is to provide users with an easily accessible, low cost, comprehensive profile of high-quality, reliable data on environmental fate and effects, safety and handling procedures, and regulatory/reference data for those chemicals most frequently of concern to state officials.

The Group considered the options outlined by Dr. Kissman to the plenary session, with one addition: the *Master File*, in which all the data is contained in

one database; a *Network of Files*, in which several files with similar attributes--format, quality control, chemicals covered, etc.--can be entered via one central access point; an *Umbrella System*, in which a series of databases are made available on a central system with a single access and search procedure; and *Gateway Technology* for access to various databases. The Group rejected the *Status Quo* as an option.

Master File. The Group viewed the *Master File* as something of a "one-stop shopping center." There are many advantages to such a file:

1. The extent of detail and the quality of the data can be rigidly standardized and controlled for all categories of data.

2. It is easier to manage the development of the database, so that, for example, data can be developed in each category for a given chemical.

3. Users need have only one code/account for their information needs and need learn only one search/retrieval system.

4. There would be little or no redundancy since all data would be retrieved in the same format.

5. The cost of developing a *Master File* would be considerably less than that for several databases created by different organizations.

The major disadvantages to the *Master File*:

1. Either the database must be built from scratch, or there must be an accord to use an existing file as its foundation.

2. There will likely be "territorial" problems with those already in the business of building databases.

The group endorsed this option as the ideal solution, but recognized that administrative and political problems pose difficulties.

Network of Files. The *Network* would be a series of files created and owned by different organizations which have reached agreement on such matters as content, quality control and format and which have established a central access point for the databases. In this arrangement, one organization, for example, would prepare the environmental file, another the safety file, and so on. There would be only one set of search and retrieval procedures for users to learn.

The *Network*, the Group agreed, would require a high level of coordination for success.

Umbrella System. The Group considered this system to be a series of databases which can be accessed from a central entry point and for which there would be a single search and retrieval procedure. The major problem with the *Umbrella System*, the Group concluded, and one which distinguished it from the *Network of Files*, is the lack of control over database quality and content.

Gateway Technology. The group viewed the Gateway simply as a central means of access to otherwise unrelated databases, which have little or no commonality of content, quality control or format. The Group considered this only minimal improvement over the present situation.

In conclusion, the Group considered the *Master File* the option to be preferred, even with its potential administrative problems. Its advantages in format, quality control, coverage of chemicals and access procedures far outweigh its disadvantages. And, the group concluded, the administrative problems are not, in the end, insurmountable.

The *Network of Files* (or the *Umbrella System*) is also a worthy option if it is possible to reach agreement on the features which make the *Master File* attractive: format, quality control, standardization of data sources, etc.

WHAT THE MASTER FILE WOULD LOOK LIKE

The goal of any shared information resource is, to repeat, comprehensive, high-quality data which is fully referenced and which can be retrieved with minimal effort and duplication. The *Master File* is the best option for achieving this goal (although a *Network of Files* or a coordinated *Umbrella System* would be a great improvement over the present situation). The *Master File*, as the Group envisioned it, would have three types of records:

1. Very detailed and comprehensive records for a small number of chemicals (200-500) which are consistently of great interest to the states as health hazards and which are the subject of regulatory action. These records would be developed with primary literature as much as possible, would be fully referenced, with high quality control, and would be kept current.

2. Less detailed but relatively comprehensive records on several thousand chemicals of lesser importance, for which fewer inquiries are received. (The HSDB would suffice for this file.) A combination of primary and secondary sources could be used, and current plans for quality control should be sufficient.

3. For more obscure chemicals, a short summary with pertinent references should be sufficient. Such documents as ITCs, IRs or EPA data reviews could be used.

4. RTECS (with its more than 70,000 records) would be sufficient for the even more obscure chemicals, those which are unlikely to be encountered as major health hazards or as subjects of state regulation.

STEPS FOR CREATING A NETWORK OF FILES

The Work Group considered the following steps necessary for creating a *Network of Files*:

1. Establish a state/federal steering group to coordinate plans, procedures and overall development of the Network.

2. Identify a central focus for the database development. The Group recommends that a federal agency have responsibility for the actual development, since a federal agency is in a better position to be "central" to the effort. Nevertheless, it should not be forgotten that states have important scientific capabilities and data resources to contribute.

3. Undertake a more refined effort to identify the information needs of the states and the resources that the various states might bring to the development of the Network. The California survey is only a first step toward this end. (For example, California reviews a series of journals and could provide information from a "source" standpoint. Michigan reviews journals from the standpoint of the individual chemical.)

4. Develop a plan for using existing resources in the Network and for identifying where additional resources are needed.

5. Develop standards/agreements for (a) data elements; (b) data sources; (c) data extraction; (d) data entry; (e) data formatting; (f) data retrieval/search; (g) data output; (h) quality control

6. Prepare an overall implementation plan for achieving other actions. A joint content/systems subcommittee to the steering committee could pursue this further.

7. Achieve immediate improvement over the existing situation by linking three or four databases on the same computer with the same delivery system. Data elements could be mapped among databases in order to define areas of overlap and complementation. Data elements could be standardized and defined for the user.

RECOMMENDATIONS

The Database Content Work Group makes the following recommendations:

1. Pursue, as a long-term project, the development of a *Master File*.

2. Initiate immediate action to establish a *Network of Files*, which ultimately might be incorporated into a future *Master File*.

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REPORT OF THE DELIVERY SYSTEMS WORK GROUP

chaired by

DENNIS BENSON, Ph.D.

Information Technology Branch
National Library of Medicine

In carrying out its charge to identify the delivery system which best fits the needs of the various users of environmental and toxicological information resources, the Delivery Systems Work Group first considered the general requirements which the delivery system would have to meet:

Audience. The audience, ranging from the general public to government specialists, will have a broad range of information needs, from the general to the highly technical.

Information. In serving its audience, the system will have to strike an appropriate balance between general and specialized information. The data will have to be better defined and evaluated, and there should be expanded mnemonics to identify topic labels.

Usage. The system should maintain the sophisticated features of present systems, but should also provide for a wide range of computer expertise among users and should include definitions of data elements online.

Data Needs. The most commonly requested types of data are (in no particular order): ground water contamination; environmental; material safety; modeling and simulation; aquatic and pesticide; and environmental fate.

Output. The system should have report writing capability, with the ability to present data in tables, and should allow for the distribution of data on floppy diskettes.

User Needs. The system should be easy to use (user-friendly) and should allow easy access by telephone. There should be a variety of search and sort options. The data should be factual, rather than bibliographic, and the databases should be updated regularly. Users should be involved in the design of the system.

Of the four Options outlined by Dr. Kissman to the plenary session, the Group dismissed the *Status Quo* Option as unacceptable to all, and ranked the other three Options, for the purposes of discussion, in descending order of preference: *Gateway Technology*, *Umbrella System* and *Master File*. The *Master File* was seen as a theoretical ideal, but was not considered practical because there were too many administrative obstacles to developing and, more importantly, maintaining it.

From the Work Group's discussion, the advantages and disadvantages of the *Umbrella System* and *Gateway Technology*, presented schematically, are as follows:

UMBRELLA SYSTEM

ADVANTAGES	DISADVANTAGES
Central coordination	Complete coverage impossible
User needs only a single account	Licensing
Environment for new database development	Databases may outlive usefulness
File identity preserved	
Emulate *Master File*	

GATEWAY TECHNOLOGY

Databases retain identity	Extensive support needed for distributing updated software
Design more generic	Computer required will either be a central system or a user's PC
User may modify	User needs multiple accounts
Tailored interfaces	
Pay only for databases used	
Order databases by content	
Can be implemented now	

The determining factor in choosing between *Gateway Technology* and the *Umbrella System*, the Group agreed, should be current availability. Most states have neither the resources nor the mandate to pursue "tools"--be they systems, databases or networks--which are not now readily available.

The microcomputer version of the Chemical Substances Information Network (CSIN) is the leading current example of *Gateway Technology*, and NLM's TOXNET is the leading example of an *Umbrella System*. Since TOXNET allows complementary files to reside in the same system and to be searched with the same software, the Delivery Systems Work Group recommended it over CSIN. However, the Group recommended as the best of all possible worlds a marriage of *Gateway Technology*, where the software resides with the user, and the Umbrella concept of associated files.

The Systems Work Group also considered, as an important part of any shared system that may be developed, the need for communications among users. MINET, the AMA/GTE electronic mail/bulletin board system, is offered to state health departments through the Public Health Foundation, and is currently avail-

able in one form or another to some 40 states. The Group considered MINET the best available system for linking federal and states agencies together for the purposes of exchanging information and ideas.

RECOMMENDATIONS

The Systems Work Group made the following recommendations to the plenary session:

1. Establish a steering committee of representatives from federal and state agencies to carry on the effort to coordinate after the Workshop.

2. Create a TOXNET users group to evaluate the suitability of TOXNET for the shared system. (Use the TOXNET mail system for comments.)

3. Create a micro-CSIN users group for the same purpose.

4. Consider for inclusion in the shared system such databases as Cain/Agricola (DoA), the PoisIndex (PCC/Denver), and Emergency Medicine.

5. Explore the possibility of sharing with the European Community's ECDIN database system.

6. Explore the possibility of including airborne modeling packages in the *Umbrella System.*

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APPENDICES

APPENDIX A

AGENDA

STATE/FEDERAL WORKSHOP

ON

JOINT DEVELOPMENT OF ENVIRONMENTAL AND TOXICOLOGICAL INFORMATION RESOURCES

Lister Hill Center Auditorium

National Library of Medicine

Tuesday, May 28, 1985

REGISTRATION	8:00 - 9:00
Lister Hill Center Lobby	
I. PLENARY SESSION	9:00 - 12:30
Lister Hill Center Auditorium	
A. Introduction	9:00 - 9:15
o Dr. Gib Parrish (Workshop Chair) Hazard Evaluation System Information Service California Dept. of Health Services	
B. Welcome: National Library of Medicine	9:15 - 9:30
o Dr. Harold Schoolman Deputy Director for Research and Education National Library of Medicine	
C. Keynote Address	9:30 - 10:00
o The Hon. A. Alan Hill, Chairman Council on Environmental Quality	
D. Results from the California Dept. of Health Services Survey	10:00 - 10:30

o Ms. Elinor Blake
Hazard Evaluation System Information Service
California Dept. of Health Services

COFFEE BREAK - Lister Hill Center Lobby 10:30 - 10:50

E. Overview of State Databases 10:50 - 11:10

o Mr. Richard Powers, Chief
Toxic Chemical Evaluation Section
Michigan Department of Natural Resources

F. Overview of EPA Databases 11:10 - 11:30

o Mr. Paul Fuschini, Chief
Chemical Information Branch
Office of Toxic Substances
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G. Overview of NLM Databases 11:30 - 11:50

o Dr. George F. Hazard, Chief
Chemical Information Services Section
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National Library of Medicine

H. Options for Data Sharing 11:50 - 12:10

o Dr. Henry M. Kissman, Associate Director
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I. Guidelines for Work Groups 12:10 - 12:30

o Dr. Gib Parrish

LUNCH - Lister Hill Center Cafeteria 12:30 - 1:30

II. WORK GROUPS ASSEMBLE IN ASSIGNED ROOMS 1:30 - 5:30

A. Group 1: Administrative Considerations

o Chairman: Joan K. Leavitt, M.D.
Commissioner
Oklahoma State Dept. of Health

B. Group 2: Database Content

o Chairman: Dr. Norbert P. Page
Manager, Risk Assessment Dept.
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C. Group 3: Delivery Systems

o Chairman: Dr. Dennis Benson
Information Technology Branch
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Wednesday, May 29, 1985

III. PLENARY SESSION	8:30 - 10:30
Lister Hill Center Auditorium	
A. Status Report on Workshop	8:30 - 9:30
o Dr. Gib Parrish	
B. Work Group Reports	9:30 - 10:30
1. Administrative Dr. Joan K. Leavitt	
2. Database Content Dr. Norbert P. Page	
3. Delivery Systems Dr. Dennis Benson	
COFFEE BREAK - Lister Hill Center Lobby	10:30 - 11:00
IV. WORK GROUPS RECONVENE	11:00 - 3:30
LUNCH - Lister Hill Center Cafeteria	12:30 - 1:30
V. PLENARY SESSION	3:30 - 5:00
Lister Hill Center Auditorium	
A. Work Group Chairmen Present Reports and Recommendations	3:30 - 4:00
B. Discussion of Final Report	4:00 - 5:00
ADJOURNMENT	5:00

APPENDIX B

LIST OF ATTENDEES

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APPENDIX C

TOXICOLOGY INFORMATION NEEDS AND RESOURCES SURVEY

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Toxicology Information Needs and Resources Survey

This survey is divided into four parts: I. Program Description; II. Chemical Information Needs; III. Chemical Information Resources; and IV. Chemical Information Products. Please complete all four parts.

Part I. Program Description

Date (mo/day/year) ____/____/____

Identifying Information:

Name_____

Title_____

Name of Program_____

Department or Agency_____

Address_____

City_____State_____Zip_____

Phone ( )_____

State Agency to which your responses apply (if different from above)_____

_____

In a few sentences, please describe the nature and responsibilities of your program or attach an existing brochure that does so:

_____

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